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A Brief Description of the Washoe Smelter



GENERAL VIEW OF THE WASHOE SMELTER.

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...BY...

Members of the A. C. M. Co.'s Staff



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WASHOE SMELTER

THE Washoe Smelter is situated about two miles east of the City of Anaconda. The smelter site includes about 240 acres and peculiarly adapts itself in topography to the efficient handling of material. By reason of its being on a hill side it is possible to make the level of delivery of the product of one building the level of the charge floor of the next succeeding one. (See diagrammatic sketch—Fig. 2—showing the flow of material through the plant and the comparative elevations.)

THE ORES.

The ore treated comes principally from the Butte district and is hauled by the Butte, Anaconda & Pacific Railway, a distance of twenty-eight miles, in trains of fifty 50-ton bottom-dump cars to the railroad yards at East Anaconda. At this point these trains are split up according to their destination,—that is, as to whether they go to the Concentrator and Sampling Mill ore bins, or to the Storage Bins. In each case they are made up into trains of eight or sixteen cars, according to the size of engine to be used, and are carefully weighed before delivery to their respective bins.

CONCENTRATOR BINS.

The Concentrator bins are of wood and steel construction and are divided as follows: Eight second-class ore storage bins having a capacity of 1,250 tons each; thirteen sample ore bins of 200 tons capacity each, and one coal storage bin of 2,500 tons capacity.

SAMPLING MILL.

This building is of wood construction throughout and is 40x60 feet and six stories high. It consists of two complete sections, each section having a capacity of 1,800 tons in 24 hours.

The ore to be sampled is taken from the sample bins by an electric locomotive and dropped into bins feeding the crushers. The discharge of these crushers is elevated to the top of the building by means of bucket elevators. The stream of ore is cut four times by Brunton automatic samplers, cutting out one-fifth of the amount each time and discarding four-fifths,—the final result being 3.2 pounds for each ton of ore crushed.

The discard from the sampling machines is elevated and dumped into concentrator ore bins, or if it is first-class ore, it is sent to the storage bins at the Blast Furnaces. The final sample is quartered

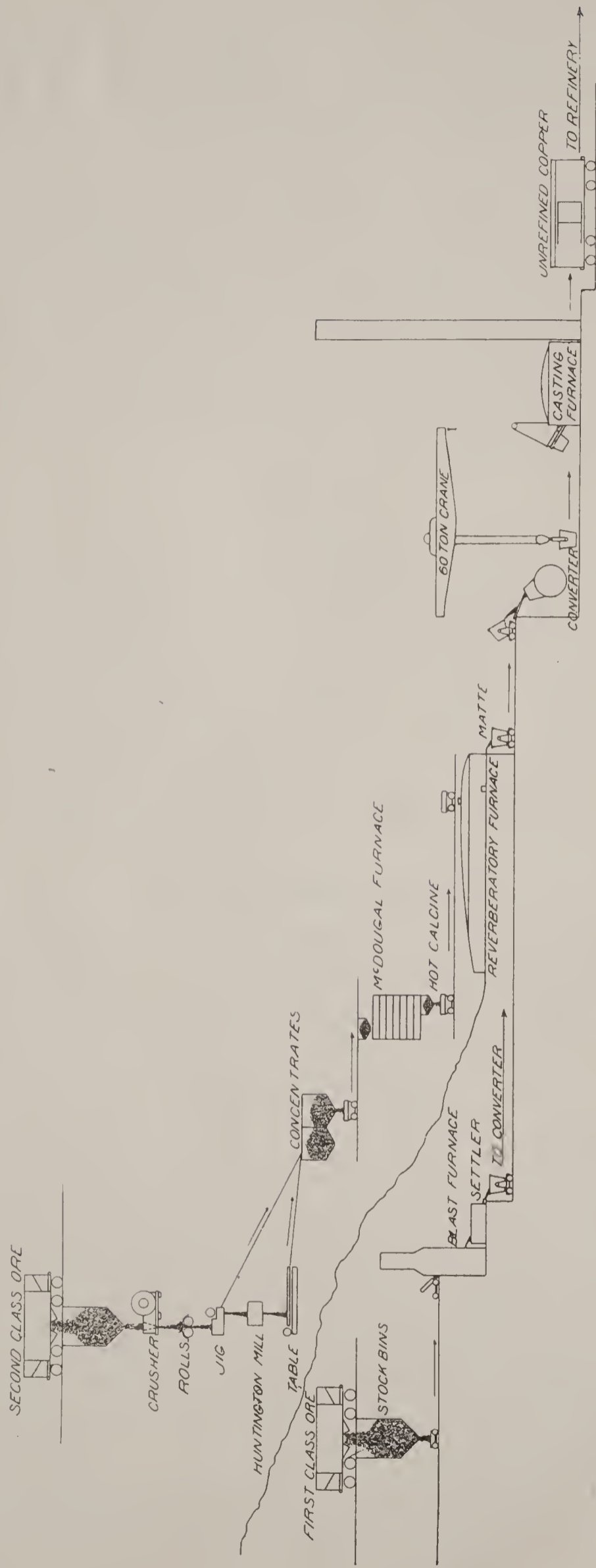


FIG. 2.—DIAGRAM SHOWING FLOW OF MATERIAL THROUGH THE PLANT.

by a Brunton quartering shovel, the resulting sample dried on a steam drier, ground in an Engelhardt sample grinder, bucked so as to pass through a 100-mesh sieve and put up in three separate sample packages, one of which goes to the Laboratory for analysis, one to the owner of the ore and one filed away for use in case of dispute.

CONCENTRATOR BOILER HOUSE.

The Concentrator Boiler House is a brick and steel building, located behind the coal bins mentioned and furnishes steam to the Concentrator Power House. It is equipped with ten 300-H. P. Stirling boilers, necessary feed pumps, etc., and has an independent steel stack 14 feet in diameter and 160 feet high.

CONCENTRATOR POWER HOUSE.

The Concentrator Power House, a brick and steel building, is located between the two concentrator buildings and is equipped with two 4-cylinder triple expansion condensing engines, each capable of developing 3,300 I. H. P. at 200 pounds steam pressure. The economical I. H. P. is 1,750, with 150 pounds steam pressure, at which they are run. There is also a 4-cylinder triple expansion Fraser & Chalmers 1,150 I. H. P. engine, used as a spare. These engines furnish power to operate the mill and electric generators. The electric generators furnish power for the city and works lighting, street car system, small power circuits in the city, and all electric power required in the works for cranes, motors, etc. The steam power will be replaced in the near future by electric power from the power plant of the Missouri River Power Company, near Helena, Montana, and power from Flint Creek Falls, 22 miles west of Anaconda.—the steam plant remaining intact as a reserve.

CONCENTRATOR.

The Concentrator consists of two steel and wood buildings, each being 255x350 feet and containing four complete sections, or eight in all. Each section is equipped with the same kind of machinery, and will handle 1,100 tons of ore in 24 hours. The equipment of one section is as follows:

- 1 12x24-inch Blake crusher.
- 2 7x10-inch Blake crushers.
- 6 Coarse concentrate Hartz jigs.
- 1 Set of 15x42-inch coarse rolls.
- 1 Set of 15x42-inch fine rolls.
- 36 Fine jigs (Evans patent).
- 1 Set of 15x42-inch middlings rolls.
- 18 Middlings jigs (Evans patent).
- 3 6-foot Huntington mills.
- 18 Fine finishing jigs (Evans patent).
- 33 Wilfley tables.

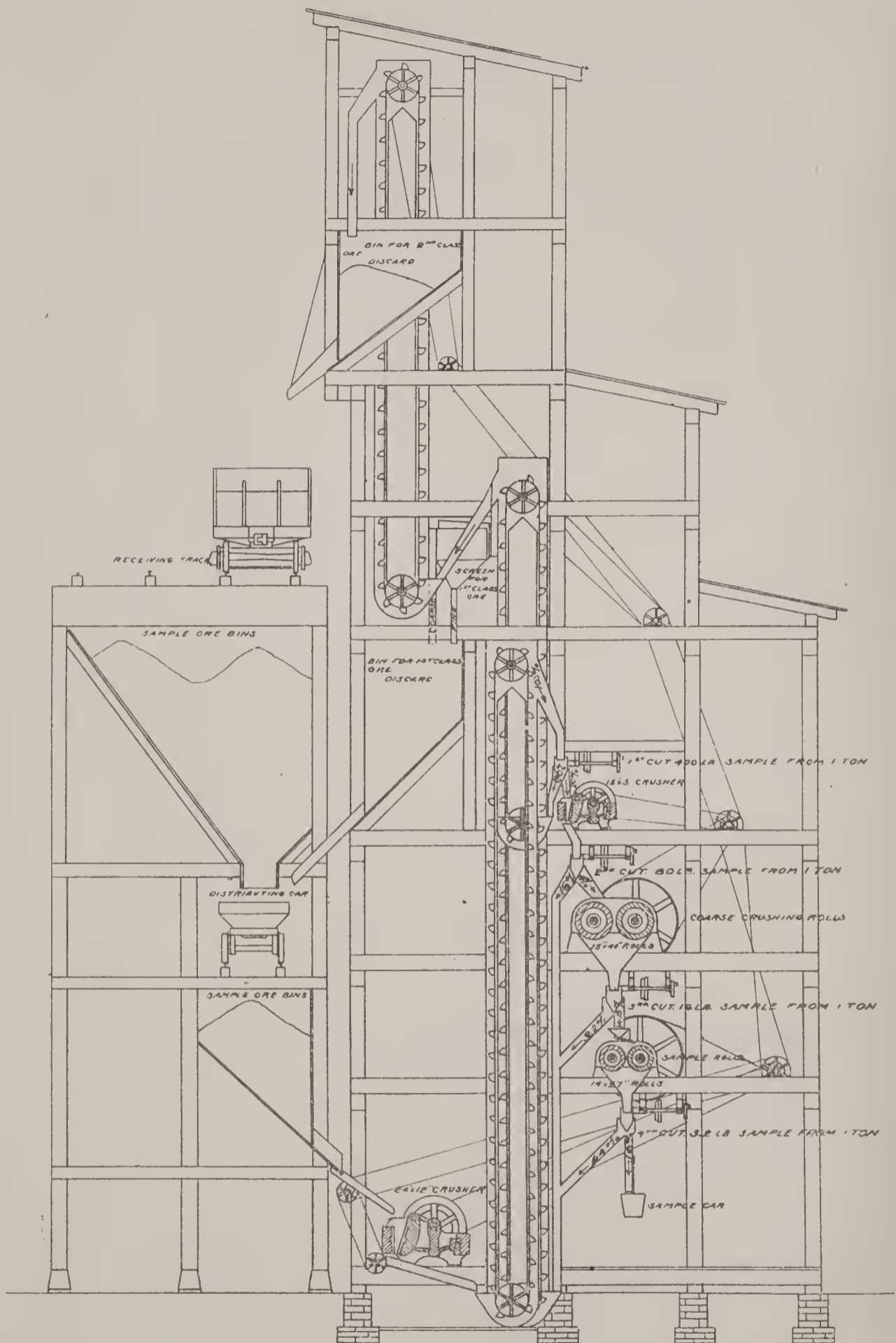


FIG. 3.
CROSS SECTION OF SAMPLING MILL.

Besides a large number of classifiers, settling tanks, dewatering tanks, elevators and trommels of various sizes. A system of launders carries the concentrates to the settling tanks at the foot of the Concentrator building.

The Tank House is a frame building 70x670 feet and contains nine settling tanks for each section. These tanks are 19x19x15 feet high,—each having a capacity of 420 tons of concentrates. These nine tanks are divided as follows: Six for first settlement of the concentrates, and three for second settlement of the concentrates, or, in other words, for settling the overflow of the first settlement tanks; the overflow from the second settlement tanks goes to three large tanks common to all sections in that half of the mill,—the overflow from these tanks going to the slum pond with the slum water from all the settling tanks and Wilfley tables. The concentrates caught in the first settlement tanks are called “fine concentrates”; those of the second settlement tanks called “second settlement concentrates,” and those of the third settlement tanks are called “tank slum.” The first two products are treated in the Roaster Building, the third at the Briquette Plant.

SLUM PONDS.

The Slum Ponds are situated in the valley below the works. There are six ponds of different sizes, but averaging about 300x630 feet, and the slum water, containing the greater metal values coming from the Concentrator, goes to these ponds for settlement. When a pond is full, the water is diverted to an empty pond, and as much water drained off from the full pond as possible. The pond is then excavated by one of two Lidgerwood traveling cableways, each having a bucket capacity of five tons. The slum is piled outside of the pond and allowed to drain and dry, and from these piles it is taken by cableway and dropped into a hopper on trucks, from which it runs into the railroad cars beneath and is taken to storage bins for use at the Briquette Plant. The slime water containing the least values is used for condensing purposes and for sluicing slag at the Reverberatories and Blast Furnaces.

The settling tanks containing fine and second settlement concentrates are emptied from the bottom, after draining, into the cars of the Local Tramming System and transported to the charge floor of the Calcine Building,—the material being weighed and sampled before dumping. It is the practice at this plant to weigh and sample the material entering and leaving every building, so that an accurate check is kept on the work of each department.

ROASTER BUILDING.

This building is of steel construction throughout and is 96x412 feet. It contains 64 McDougal calcining furnaces of the Evans-Klepetko type. These furnaces have six hearths, 16 feet in diameter and are 18 feet high; they have revolving water-cooled shafts and

arms, driven by suitable gearing from the top. The rabblers are so set as to move the material from circumference to center and vice versa, on alternate hearths until it finally drops into the calcine hoppers immediately over the tracks of the Local Tramming System for transportation to the charge floor of the Reverberatory Building. No fuel is used other than the sulphur in the concentrates, the burning of which furnishes sufficient heat to do the calcining, except on occasions when the furnace is not hot enough to ignite the sulphur, at which times fine coal is fed. The gases are taken through brick flues into large brick and steel dust chambers, where a large proportion of the flue dust is settled. This dust chamber is so arranged that the bottom is a series of hoppers, so that the entire contents of the dust chamber can be drawn out into the flue dust cars of the Local Tramming System and sent directly to the Reverberatory furnaces for smelting.

The material which sticks to the rabble arms, center shaft, etc., called "barrings," is barred off and sent to the Blast Furnaces. Fine limerock and the screenings from first-class ore in sufficient quantities to produce the slag desired in the Reverberatories are charged with the fine concentrates through the feed hoppers of the roaster for the purpose of getting an intimate mixture. Each furnace is capable of handling 45 tons of material in 24 hours.

REVERBERATORY BUILDINGS.

This plant consists of two steel buildings each 183x225 feet, each containing four coal-fired furnaces the hearth dimensions of which are 19 feet in width and from 102 feet to 116 feet in length, with a grate area of 8x16 feet and a smelting capacity of 300 tons per 24 hours, on natural draft.

The fuel used is Diamondville coal, shipped from the mines in Wyoming, owned by the Washoe Copper Company. The coal is dumped into hoppers that have four points of discharge directly over the fire-box. It is the custom here to charge the furnaces from the first two hoppers next to the bridge-wall of the furnace and to use charges weighing about 15 tons.

The flame, after leaving the furnace, passes through two 375 H. P. Stirling boilers, in tandem, which reduce the temperature of gases going to the main flue to about 600 degrees F. By this means 600 B. H. P. are obtained from each furnace from the waste heat. The ashes and partially burned coal that drop from the fire-box fall into a stream of water which carries them over a grizzly, the larger pieces of ash going to the slag sluice, the smaller, containing coke and unburnt coal, being sluiced to the Coke Jigging Plant, where the coke and coal are jigged out and the ashes sent to the dump. The coal and coke recovered are elevated to a bin from which they are taken to the Briquette Plant by the Local Tramming System and there become a constituent part of the briquettes, thus obtaining

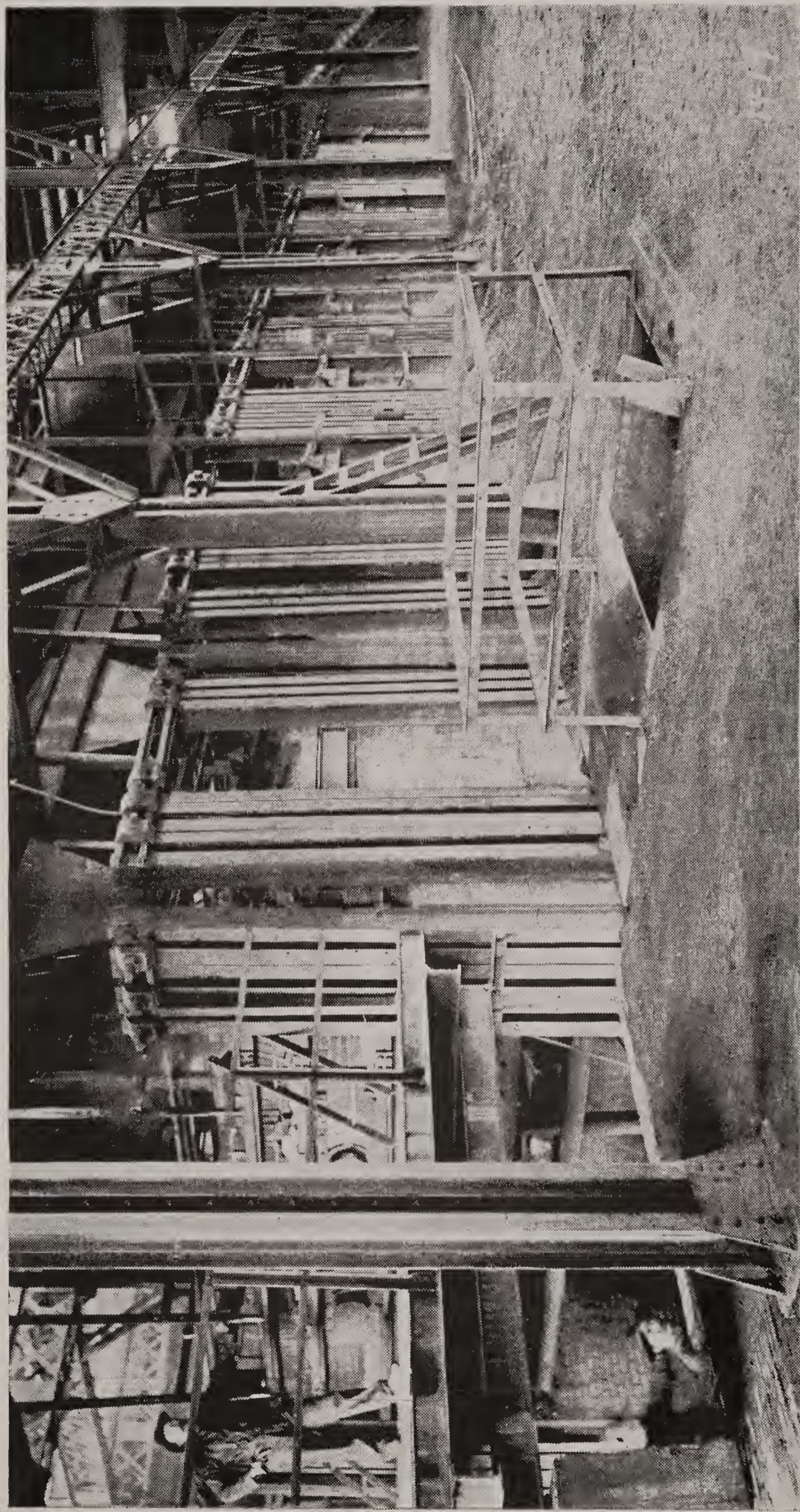


FIG. 4.—SIDE VIEW OF REVERBERATORY FURNACE.

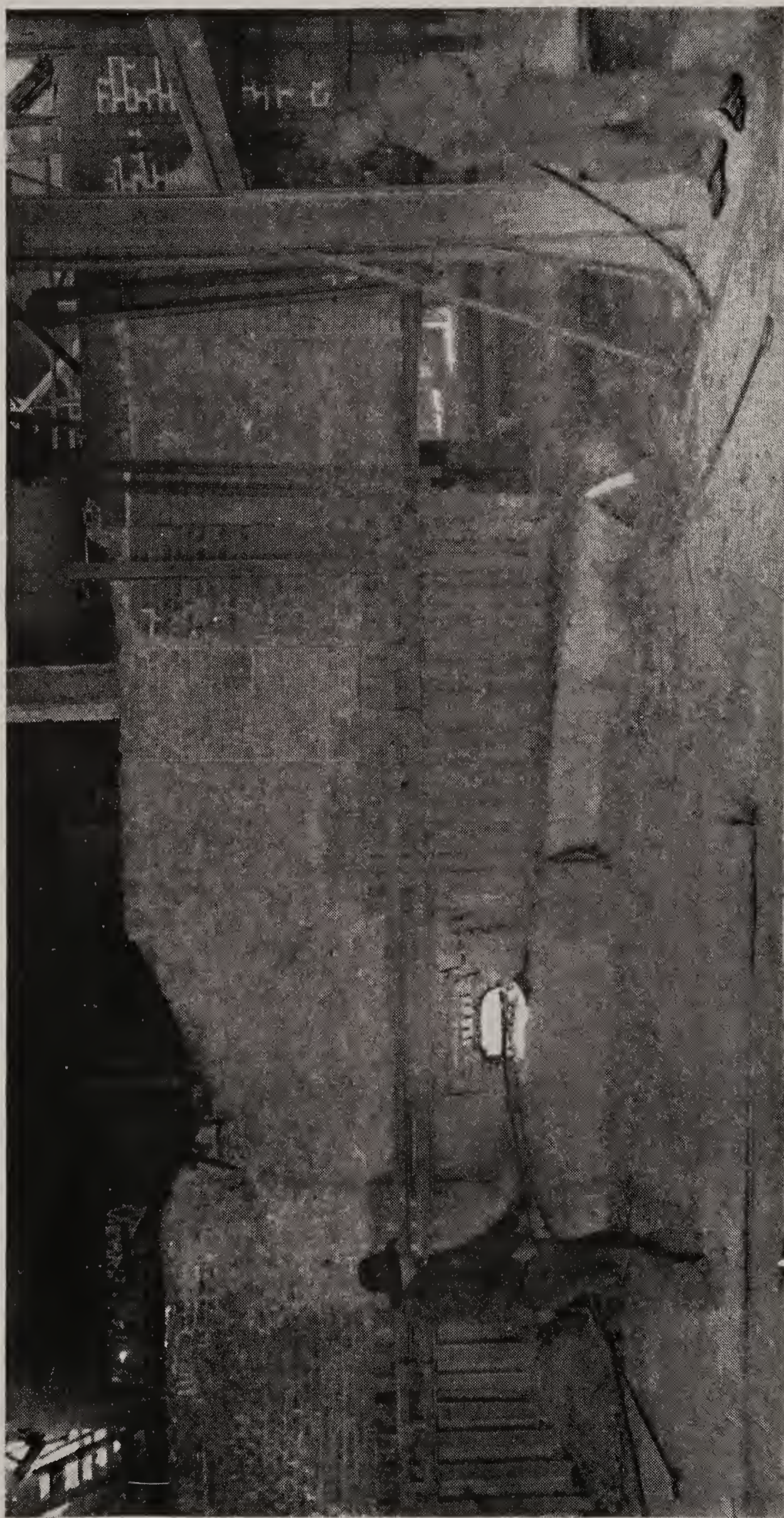


FIG. 5.—SKIMMING REVERBERATORY FURNACE.

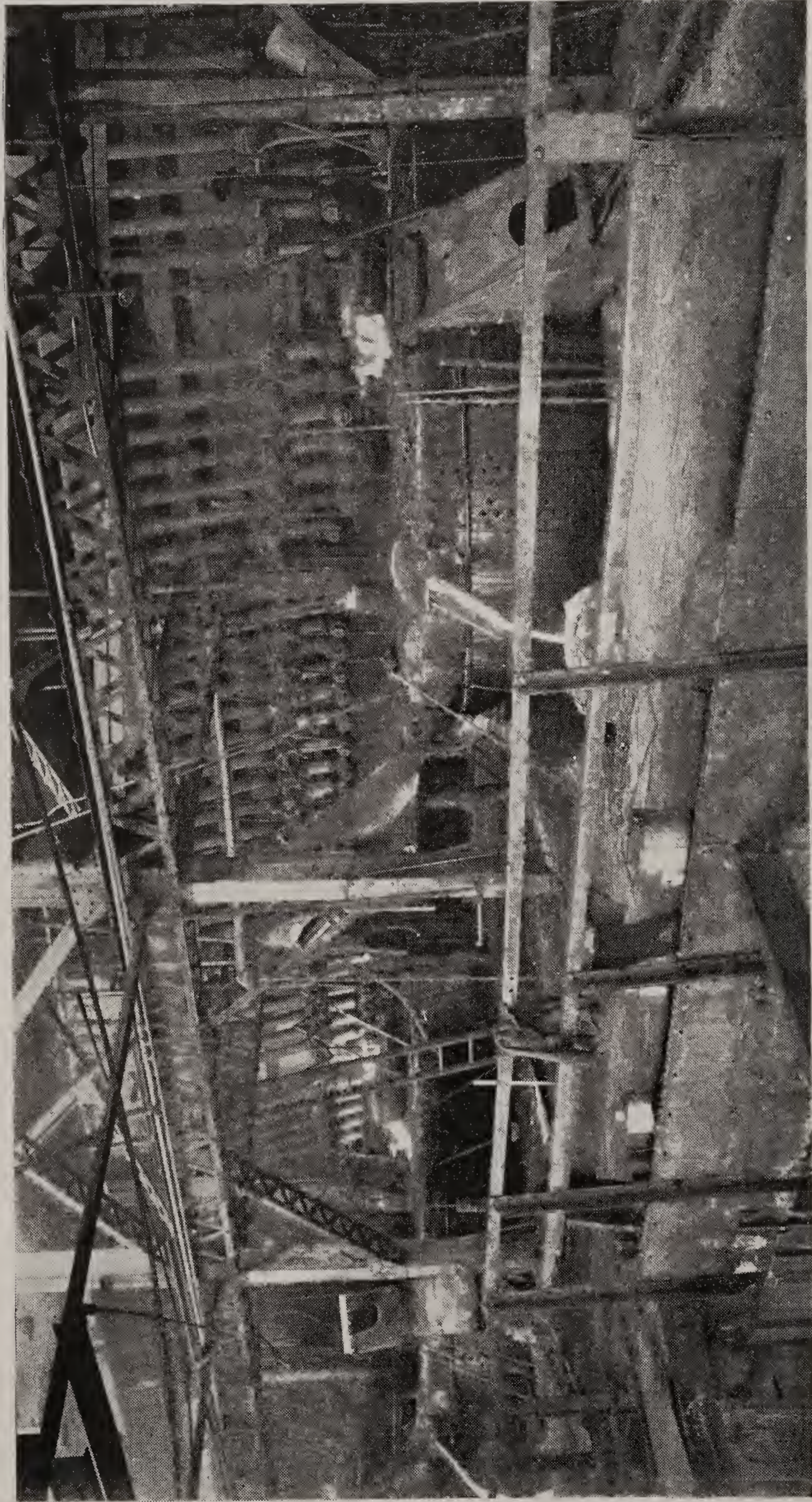


FIG. 6.—FIFTY-ONE FOOT BLAST FURNACE—TAPPING FLOOR.

a fuel value from an otherwise waste product. By this means 10 per cent of the Reverberatory fuel is recovered.

The slag is skimmed from the Reverberatories twice in eight hours; it is allowed to accumulate until its depth is from three to four inches above the skimming plate in the front of the furnace and then skimmed into a stream of slum water, which granulates and sluices it through a cast-iron-lined launder to the slag dump. By allowing the slag to accumulate in the furnace in this manner it is possible to skim the furnace very rapidly,—as much as 60 tons of slag being removed in twenty minutes. By this method the actual use of a rabble to “pull” the slag is avoided, the rabble being used to keep the “bay” clear of floating pieces of unfused silica and to prevent the flow being more rapid than the water can handle properly.

The matte is kept down some distance below the skimming plate, making it impossible to “pull” out any of the matte, thus avoiding explosions. The matte is tapped from the side of the furnace, through copper tap-hole plates, and run through cast-iron launders, lined with silicious material, to hot metal ladles of 10-ton capacity and taken by the Local Tramway to the Converters. The brick used in these Reverberatories are manufactured by the Brick Department of the Anaconda Copper Mining Company, which is located in Anaconda. They have given the greatest satisfaction. The silica brick of that portion of the roof immediately over the fire-box (and for a distance of 30 feet from the fire-box) lasting nine months and over. The remaining part of the roofs are still in good shape, having been in operation for two years. The brick are 15x6x3 inches. It is the practice to clay, or fettle, the bridge-wall and sides where needed every thirty days. The bridge-wall plate is kept cool by a circulation of air by a pipe connection to the Main Flue. The utilization of the waste heat as a steam producer and the saving of the coke from the ashes make a decided reduction in the cost of reverberatory smelting.

BRIQUETTE PLANT.

The Briquette Plant is a frame building 55x192 feet, containing four Chambers Brothers end-cut, auger-type brick machines,—each machine having a capacity of 700 tons of briquettes in 24 hours. The briquettes are made of fine concentrates, fine first-class ore, pond slum, and fine coke from the reverberatory ashes. These materials are conveyed from the Storage Bins by belt conveyers to a pug-mill, from which they discharge into the brick machine proper, where they are further mixed and forced through a former by the auger of the machine in a continuous bar. This bar is cut into briquettes, weighing about 10 pounds, by a revolving cutter peculiar to this type of machine. The briquettes are conveyed by a series of belt conveyers to storage hoppers, from which they are loaded into Blast Furnace charge cars as part of the charge.

BLAST FURNACE BUILDING.

The Blast Furnace Building is of steel construction 82x269 feet and contains three furnaces,—two of which are 51 feet long and the other 87 feet long,—having a width of 56 inches at the tuyeres. The smaller furnaces have a capacity of 1,600 tons, the larger 3,000 tons of charge in 24 hours. Figure 6 shows the general design of the small furnace; it is two jackets high and has the crucibles water-jacketed. There are two points of discharge, as shown by Fig. 6.

The bottom of the center of the furnace is of silica brick, laid on water-cooled cast-iron plates, mounted on cast-iron columns and has a gradual slope to each discharge spout. The 87-foot furnace has three discharge spouts and three settlers, but is otherwise built in the same manner as the 51-foot furnace. The 51-foot furnace has eighty-eight 4-inch tuyeres, and the 87-foot furnace has 150.

The type of furnace used is the Mathewson Patent Blast Furnace. It is very successful in operation and much easier to handle than the old style furnaces. Its advantages are: That it has increased hearth area with but two ends to bind and hold the crusts. Any crusts forming on the sides can be readily gotten rid of by allowing the furnace to run down, the crust either dropping or being readily barred. It has smaller radiating surface for the same hearth area than the smaller furnaces, uses less coke, makes a flexible unit,—as any part of the furnace can be handled as the case demands, and is susceptible of repairs without shutting down the entire furnace. Leaking water jackets may be replaced without shutting down the furnace, thereby saving considerable time. It takes from six to eight hours to change a jacket. The procedure is to shut off the tuyeres on the jacket to be changed and the one opposite, allowing the water to circulate until all buckstays, tuyere pipes, etc., are removed, and the jacket ready to be pulled out; this chills a wall inside the jacket strong enough to hold the contents of the furnace. The new jacket is placed in position, all connections made and the blast turned on and smelting resumed. The entire end of one furnace has been shut down, jackets changed, furnace cleaned out and operations resumed,—and during all this time (extending over ten days to two weeks) the other half of the furnace was in operation.

The circulation of the water through the jackets is as follows: Each individual tier of jackets forms a complete set with two feed pipes and two discharge pipes. In the case of the tier at the crucible end, the feed enters the crucible jacket, the discharge from this going to the one immediately above, the discharge of this to the top jacket,—from which it overflows to the waste pipe. The 51-foot furnace has three 7-foot 45-degree unlined steel flues; the 87-foot has five. All the flues discharge into a large brick and steel dust chamber of the type adopted for the entire plant and described under "Roaster Plant." The dust chamber is connected by a large flue to the Main Flue, which will be described further on.

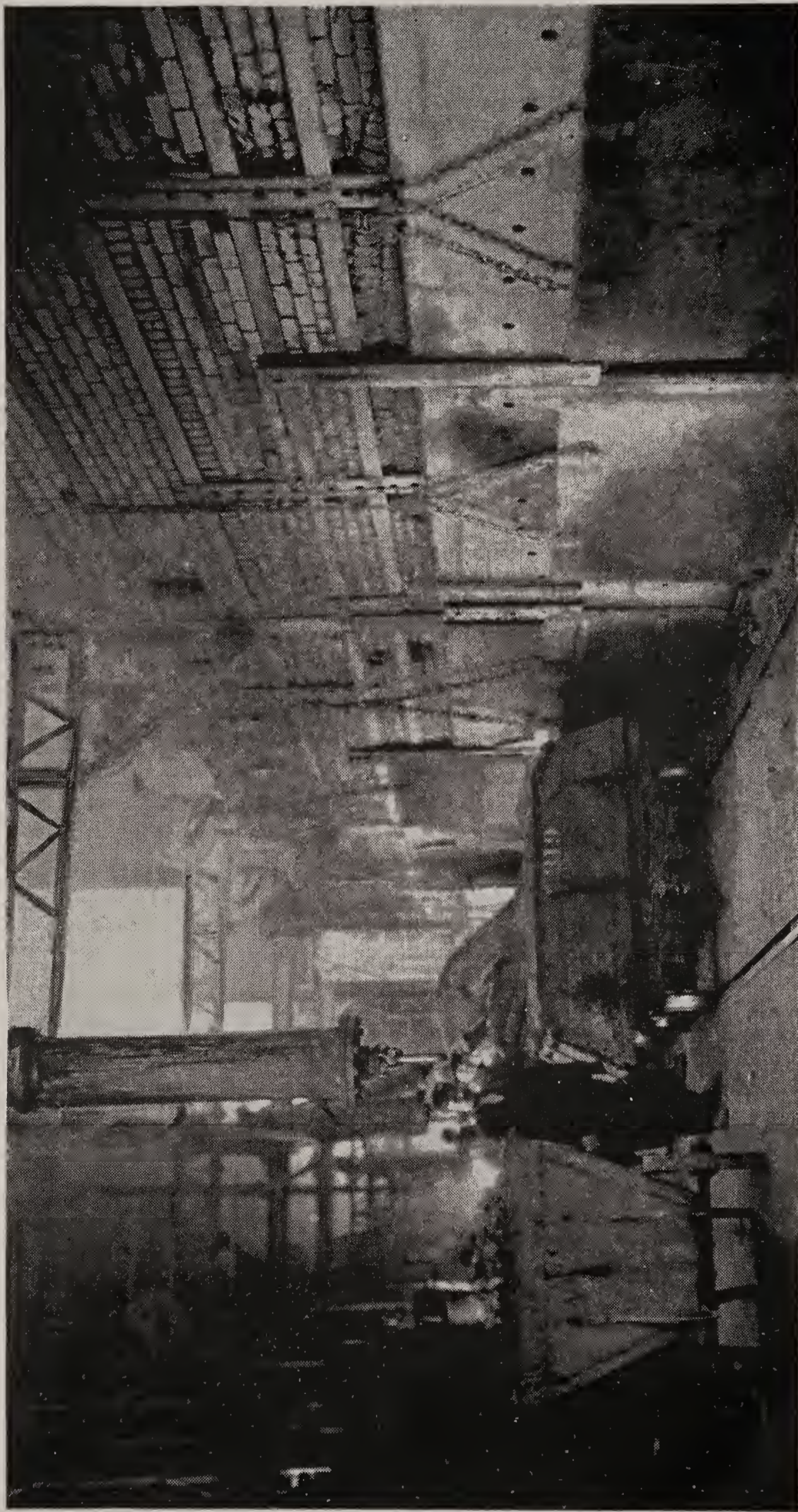


FIG. 7.—FEED FLOOR—BLAST FURNACES.



FIG. 8.—GENERAL VIEW OF CONVERTERS.

The furnaces are charged from both sides, the doors being raised by compressed air. A "charge train" consists of eighteen cars operated by the Local Trammig System. The cars receive the weighed quantities of the various materials from the Storage Bins adjacent to the Blast Furnace Building. These bins are in three rows and are built of wood. Each row is 28 feet wide, 786 feet in length and 20 feet deep, and divided into a series of bins of various sizes as required by the volume of material handled. They act as storage for first-class ore, coarse concentrates, lime rock, coal for Reverberatory and Power House, slum for briquetting, converter lining, etc., and are filled from the B., A. & P. tracks on top of the bins. All gates in these bins that are used constantly are operated by compressed air. The charge train first takes its quota of slag, then ore, then coarse concentrates, then lime rock,—then goes to the Briquetting Plant, where it receives its quota of briquettes. Two charge cars constitute a charge, the weight of which varies from 8,400 pounds to 11,000 pounds, according to its composition. The train when loaded is hauled into the Blast Furnace Building, where the cars are dumped by compressed air lifts. (See Fig. 7.)

The slag and matte flow from the furnace through the discharge spouts into the 16-foot settlers, previously mentioned. The settlers are circular and made of half-inch steel plates lined with 12-inch silica brick. The slag overflows and is granulated by slum water from the Concentrator and is carried off in launders lined with cast-iron to the dump. The matte is tapped from the settler into the 10-ton hot metal ladles of the Local Trammig System and taken to the Converter Plant while still molten.

CONVERTER BUILDING.

The Converter Building, including the Converter Lining Plant, Casting Furnaces and Converters, is 176x416 feet and is constructed of steel, except the crushing and mixing department of the Converter Lining Plant, which is of wood. In the Converter Building proper there are eleven converter stands. The converters used are the horizontal barrel type, 8 feet in diameter and 12 feet 6 inches long, and are operated hydraulically. The building is equipped with two 60-ton electric traveling cranes,—one for the handling of converters when they are in need of replacement and for other work in connection with the Lining Department,—the other for handling slag and copper from the converters. There are also two 15-ton electric cranes in the Casting Department for general use.

The matte is brought from both Blast Furnace and Reverberatory buildings to the charge floor of the Converter Building, which is 23 feet above the operating floor. The matte is poured from the ladle into a launder, the end section of which is pivoted so that it can be turned out of the way when the converter is filled. The converter is filled in a nearly vertical position with the air blast on.

Seven tons of matte per charge is used whether the converter is freshly lined or not and the charge is finished to blister copper in the same converter.

The slag from the converters is poured into unlined cast-steel ladles and taken by the crane to a casting machine of the platform conveyer type, having pressed steel moulds. This slag ladle is placed in a hydraulic cradle from which the slag is poured into the moulds, chilled by sprays of water and conveyed to a steel bin outside of the building, from which it is loaded into railroad cars and transferred to the Storage Bins for Blast Furnace use.

The blister copper is poured into a sheet steel clay-lined ladle and taken by the crane to a hydraulic cradle from which it is poured into the casting furnace.

CONVERTER LINING.

The converters are lined in the main Converter Building, but the lining material is prepared in a building 40x62 feet on the southwest corner of the Converter Building. The lining material is highly silicious ore, having gold and silver values, and pond slum is used as a "binder." The material is crushed by a Blake crusher and fine rolls, sized by trommels and sent to the bins, which feed four Carlin 7-foot grinding and mixing pans. Here it is ground and mixed with pond slum to the proper consistency and then transferred to the converter where it is tamped around a steel form by a special Ingersoll-Sergeant tamping machine, 5-inch diameter and 20-inch stroke. This tamping machine is supported by a revolving jib crane, the vertical motion of which is controlled hydraulically. After lining, the converter is removed to the drying stand by the crane, where it is dried with coal and scrap wood from all over the plant, especially from the Concentrator and Sampling Mill.

REFINING AND CASTING.

There are three casting furnaces, two having a capacity of 95 tons and one 110 tons; two of these are in operation all the time. The copper is poured in at the side and as soon as the furnace contains fifty or sixty tons, the oxidation by 90-pound air pressure is commenced. When the furnace is full, the slag is removed and oxidation is completed; it is then "poled" back to the desired pitch and cast. The casting machine is a platform conveyer with the moulds attached and operated hydraulically. The molten copper is run into a suspended ladle, from which it is poured hydraulically into the mould on the machine. When a mould is full the ladle is dropped to a horizontal position and the conveyer is moved so as to bring the next mould into position, and the process is repeated. This machine is capable of casting 25 tons per hour.

The copper is chilled by a spray and when "set" is dumped from the mould onto a platform conveyer, operating through a tank of

water, then trucked to scales, weighed and shipped to Eastern refineries.

SMELTER POWER HOUSE.

The Smelter Power House is a brick and steel building 85x526 feet and contains the various engines, compressors, blowers and auxiliaries necessary to produce the various pressures of air required.

In this building there are six Connersville and four Roots blowers, direct-connected to Corliss engines, and each having a capacity of 300 cubic feet per revolution, compressing to 40 ounces 360,000,000 cubic feet of free air in 24 hours for blast furnace use. There are six 16-pound air compressors, compressing about 60,000,000 cubic feet of free air in 24 hours for converter use. Three 90-pound air compressors for general use, such as shop tools, air gates, raising blast furnace doors, dumping blast furnace charge cars, tamping converters, etc. Four 900-pound air compressors for the air locomotives of the Local Trammimg System. Four hydraulic pressure pumps and accumulators, pumping water up to 360 pounds for use in hydraulic apparatus at Converter Plant, and all the necessary auxiliaries, such as gravity condensers, dry vacuum pumps, feed-water heaters, boiler feed-pumps, etc. The steam for these engines is supplied from the waste heat boilers at the Reverberatory Building and from twelve Stirling boilers in a boiler room bricked off from the Power House. The latter will be largely replaced by electric power in the near future.

LOCAL TRAMMING SYSTEM.

The equipment of the Local Trammimg System consists of seventeen of the H. K. Porter & Co.'s air locomotives, weighing from 12½ to 22 tons each, and 240 cars of various kinds. The locomotives operate with 900-pound air pressure in the receivers, which is reduced by means of reducing valves to 150 pounds for use in the cylinders.

There are 48 miles of standard gage tracks in the works.

This department handles about 13,000 tons of material each 24 hours. The charging stations are placed at convenient points throughout the works and are fed by an extensive piping system. The locomotives are charged about every 20 minutes,—this varies according to the nature of the work,—it takes about two minutes to charge.

FLUES AND STACKS.

There is an elaborate flue arrangement, especially noted for its immense size. The three principal flues, viz., the Blast, Roaster and Reverberatory, are 20 feet wide and 15 feet high and of brick and steel construction. The Converter flue consists of two 7x7-foot flues. The Blast, Roaster and Converter flues connect with their respective

dust chambers; the Reverberatory flue with the furnaces direct. The flues are of the following lengths:

Blast	1,653 feet
Roaster	488 feet
Converter	703 feet
Reverberatory	842 feet

These flues all merge into one Main Flue, whose plan and cross-section are shown in Figs. 9, 10 and 11.

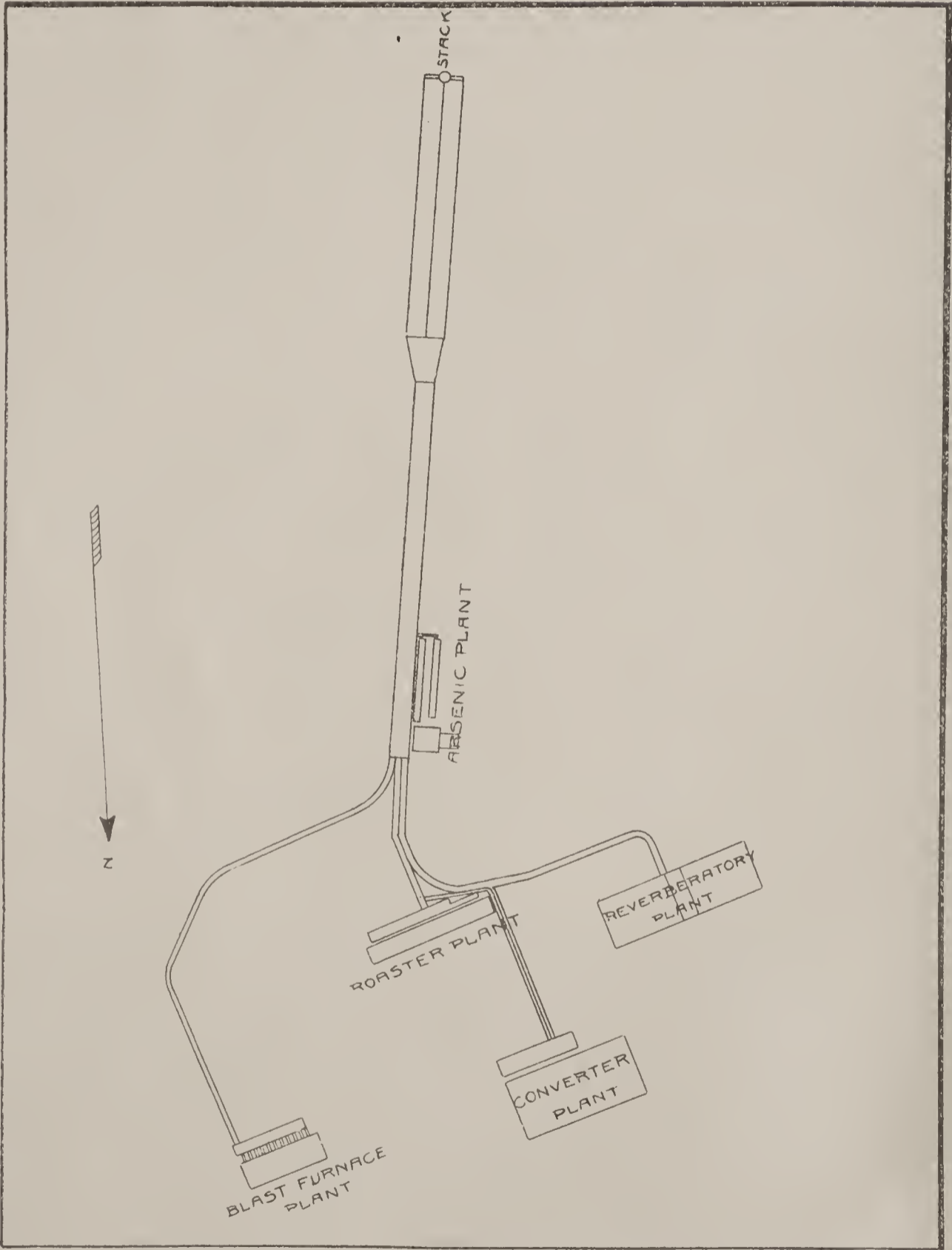


FIG. 9.

For the first 1,200 feet this flue is 60 feet wide; side walls 20 feet high; the bottom being excavated at an angle of 30 degrees from

the horizontal. The roof is of I-beam and brick arch construction. The remaining distance to the stack is 1.122 feet of 120-foot flue as shown in Fig. 11.

CROSS SECTION OF SINGLE SMOKE FLUE

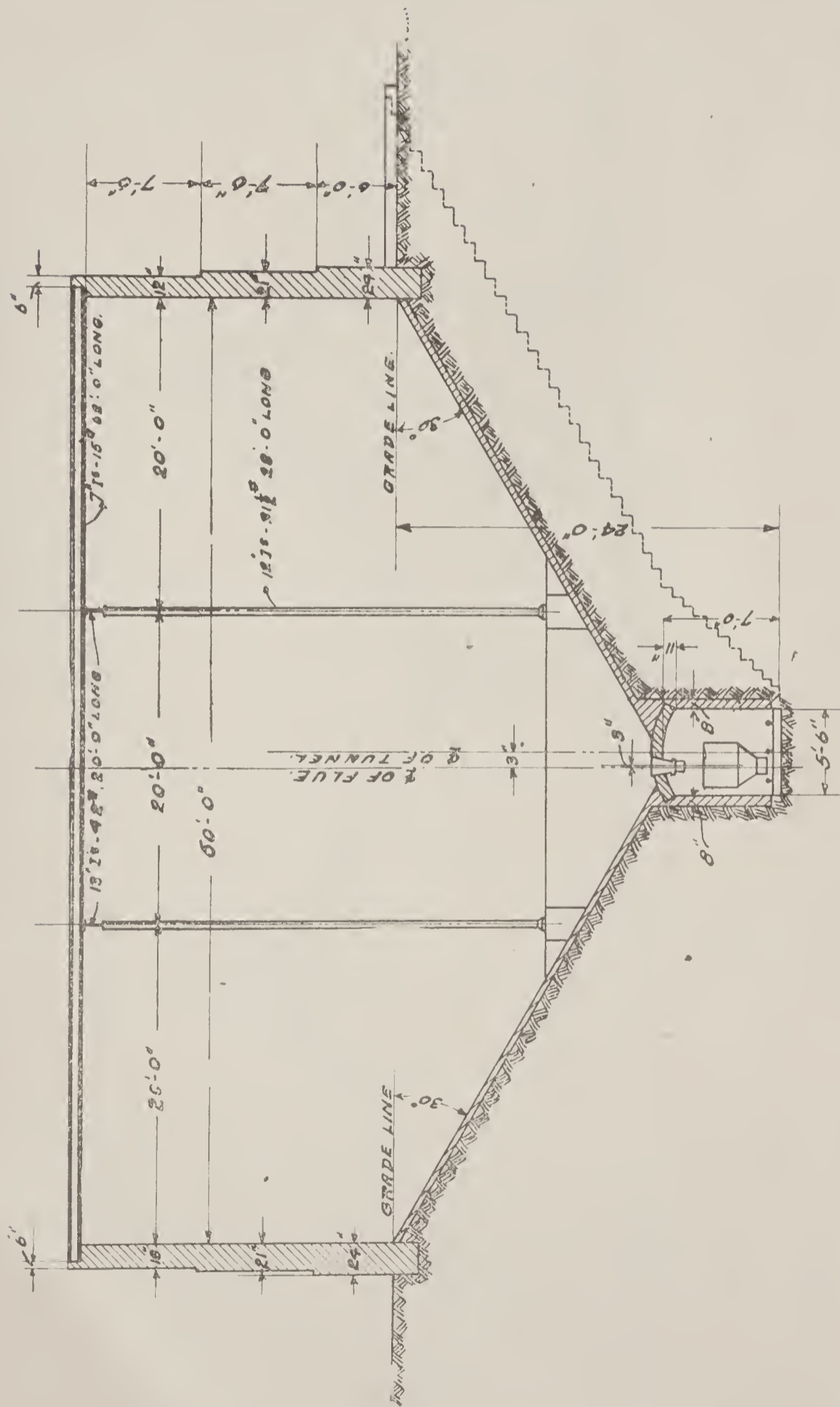
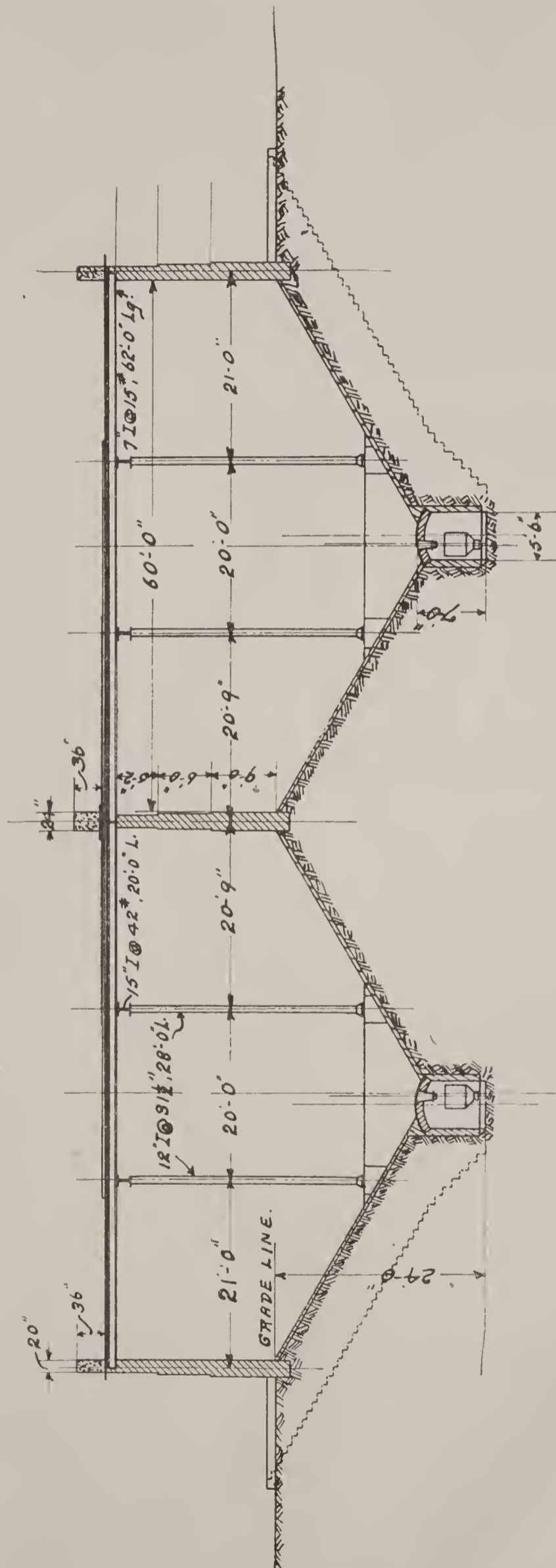


FIG. 10.



CROSS SECTION OF DOUBLE SMOKE FLUE

FIG. 11.

This portion of the flue has a roof of No. 9 sheet steel. The stack is 300 feet high with an inside diameter of 30 feet. The top of this stack is 932 feet above the surrounding valley.

The flue dust is drawn off through hoppers, spaced every 10 feet in the tunnel, as shown in Fig. 10, into cars operated by the gravity system from a set of drums placed immediately behind the stack. When the cars are loaded they are sent to the lower end of the Main Flue and elevated to the adjacent flue dust bins. There are two sets of bins here,—one for the flue dust containing the desired percentage of arsenic for the Arsenic Plant,—the other for flue dust to go directly to the Reverberatories.

ARSENIC PLANT.

The flue dust intended for the Arsenic Plant is conveyed from the bins by inclined revolving pipes into the feed hoppers of two Brunton revolving hearth roasting furnaces. The arsenic fumes from these are conducted through 240 feet of zigzag flue, cooling off the gases from which sublimes the arsenic giving a product of about 90% As_2O_3 . When a sufficient quantity is produced, the roasting furnaces are shut down, and this product handled by wheelbarrows to a small reverberatory refining furnace, fired by coke, and re-sublimed in a similar zigzag flue, thus getting a product of 99.80% As_2O_3 , which is then ground and barreled for shipment.

• All residues from the roasting furnaces are transported by the Local Trammig System to the Reverberatory Furnaces for smelting.

CHANGE HOUSE.

For the convenience of the men there is provided a brick change house, 55x97 feet, containing 1,528 lockers, steam heated and ventilated by an independent system of flues to the outside air. Hot and cold water are provided, as well as shower baths. In this building there is an Emergency Hospital, with a trained nurse in attendance, who gives first aid to the injured and attends to the minor cases of injury. For serious cases a modern ambulance is available to take the patients to the hospital in the city.

FOUNDRY AND SHOPS.

The different shops, such as the carpenter, machine, boiler, blacksmith, pipe and electric, are all equipped with the tools and machinery necessary for repair work; the new work and heavy repair work being done at the Foundry and Machine Shop, operated by the A. C. M. Company for the mines and smelters, as well as custom work. This establishment is located on the outskirts of Anaconda.

LABORATORY SAMPLING MILL.

All the metallurgical samples taken throughout the works are sent to the Laboratory Sampling Mill (which is a brick building 29x63 feet), and there prepared for the Chemical Laboratory.

About 9,000 samples of all kinds of material in process of treatment are prepared each month.

LABORATORY.

This is a large brick and stone building of two stories, fitted with all the necessary appliances for the making of chemical analyses of the ores, and also for assaying. All samples taken in the works and at the Sampling Mill are sent to this department and there analyzed for such elements as copper, gold, silver, iron, lime, silica, alumina, zinc and sulphur. There are 15,000 actual determinations made each month.

In the basement of the Laboratory there are quarters provided for the Testing and Photographic departments. In the former there are the recording instruments of a branch station of the United States Weather Bureau, connected electrically with the station about a mile distant on the top of a hill to the south of the big stack.

GENERAL OFFICE BUILDING.

This building contains the offices for the Manager, Assistant Superintendents, Chief Clerks, Accounting Department, Engineering Department and Timekeepers; also a modern telephone exchange connecting all departments of the works and numerous outside points, such as Butte, Helena, Great Falls, etc.

A private telegraph wire connects the office with the Western Union and Postal Telegraph Companies in Anaconda.

WATER SYSTEM.

The storage system for winter supply consists of two lakes,—Storm Lake and Silver Lake. These are natural lakes, supplemented by dams to increase the volume. Storm Lake receives its water from its natural drainage area; Silver Lake is filled from its drainage area as well as receiving its greatest supply from the overflow, in the spring, of two lakes known as Twin Lakes.

In the winter time a certain amount of water is pumped out of the Silver Lake storage to supplement the water coming from the creeks below. This lake is 15 miles west of Anaconda at an altitude of 6,480 feet, or about 1,100 feet higher than Anaconda. The water from both creeks and lakes is gathered by a dam about four miles west of the city and diverted into a 5x7-foot flume, seven miles long, that carries it to the works.

IN CONCLUSION.

Some idea of the magnitude of the works may be obtained from the following figures:

	In 24 Hrs.
Amount of ore that can be treated in 24 hours.....	10,000 tons
Lime rock from adjacent quarries.....	2,300 tons
Coke used.....	650 tons
Coal for Reverberatory use.....	500 tons
Coal for Power use.....	500 tons

Water, per minute, 35,000 gallons.

Men employed in and around Anaconda, 3,000.

Monthly payroll for above, \$300,000.00.



